

**REMARKS**

The foregoing amendment amends claims independent claims 1, 12, 30, 32, 39, 46, 47 and 48 and adds new claim 51. Pending in the application are claims 1-3, 5-24, 26-48 and 51, of which claims 1, 12, 30, 32, 39, 40, 43 and 46-48 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

Independent claims 1, 12, 30, 32, 46, 47 and 48 are amended to positively recite the separation medium in the separation channels and to specify that none of the separation medium enters the fluid interface port. Support for the amendment can be found throughout the application as originally filed, at least, for example, on page 11, first paragraph.

Independent claim 39 is amended for purposes of clarity to positively recite the droplet generating system.

New claim 51 depends from independent claim 1 and further specifies a droplet generating system corresponding to the fluid interface ports, as set forth on page 13, second and third paragraphs of the application as originally filed. *No new matter is added.*

Amendment and/or cancellation of the claims is not to be construed as an acquiescence to any of the objections/rejections set forth in the instant Office Action, and was done solely to expedite prosecution of the application. Applicants reserve the right to pursue the claims as originally filed, or similar claims, in this or one or more subsequent patent applications.

**35 U.S.C. §112 Rejections**

Regarding the rejection of claim 50 under 35 U.S.C. §112 as failing to comply with the written description requirement, Applicants maintain that the subject matter is adequately supported in the specification as originally filed. However, to expedite prosecution, Applicants have canceled claim 50.

**Definition of Co-Planar**

Applicants maintain that the recitation “co-planar” denotes that the meniscus plane is the same as the side wall plane, such that the meniscus aligns with the side wall edges. The co-planar plane of the meniscus is equal to, not a subset of, the co-planar plane of the side wall. Were the Examiner’s definition is correct, the use of the term “co-planar” in the claims would be redundant and non-limiting, as the meniscus already must be located along the length of the channel side wall according to the claim language, without specifying that the meniscus is “co-planar”. The use of the term co-planar further limits the meniscus, since the meniscus must inherently be within the opening and “co-planar” further requires the meniscus to replace the removed portion. The meniscus is substantially similar to a trap-door in a floor or a dowel plug: *replacing* a removed portion, rather than forming a subset of the opening. Therefore, the recitation co-planar should be interpreted as requiring meniscus edges to align with edges of a side wall, such that the meniscus is substantially flush with the side wall at both ends.

**35 U.S.C. §103 Rejections**

In the Office Action, the Examiner rejects claims 1-3, 5-24 and 26-48 as being unpatentable over the newly cited Singh reference. Applicants submit that the claims distinguish patentably over the cited Singh reference.

Independent claims 1, 12, 30, 32, 46, 47 and 48 specify that none of the separation medium enters into the fluid interface port. In contrast, the Singh reference requires that the solution in the device substantially fill the wells 606, 612, 702 and 712, creating a *large* dead volume. The device of Singh would not and could not properly operate if the separation medium did not enter and fill the wells 606, 612, 702 and 712, as clearly shown in Figure 7B.

In addition, the Singh reference fails to disclose a fluid interface port having a diameter that is *significantly larger than* the depth. Rather, the wells 606, 612, 702 and 712 of Singh are elongated and channel-shaped. The shape and size of the claimed fluid interface port is vital to the operation of the system, as previously set forth, because the shape and size allow a *direct* interface without affecting the flow of the separation medium through the separation channels, in contrast to the cited Singh reference.

Applicants also maintain that the combinations of the Heller reference, the McCormick reference, the Amigo reference, the Simpson reference, the Howitz reference, the Bjornson reference, and/or the Sundberg reference fail to render the claims obvious. None of the references discloses a channel having a separation medium filling the channel, with none of the separation medium entering a fluid interface port formed in the side wall of the channel.

Because the cited references require a larger dead volume in an injection region in order to properly operate, this recitation is not only not disclosed in the cited references, but also not obvious from the teachings of these references. For example, the Heller reference discusses the advantages of an *enlarged* application area A in terms of sample loading accuracy in column 5, lines 32-35, which teaches *away* from a fluid interface port having minimal size and dead volume, which could provide decreased loading accuracy due to the small size. Therefore, the references require some of the fluid to enter the fluid interface port, in direct contrast to the claimed invention.

In addition, the cited references, alone or in combination, fail to disclose a fluid interface port forming a virtual wall that replaces a *removed* portion of a side wall, or a meniscus surface that is co-planar with a side wall of a channel.

In addition, the Howitz reference, in the sixth paragraph of the specification (column 1), specifies that “the length of each individual microcapillary is to be selected such that the target fluid will *spread up* to the capillary ends”, with a “meniscus at the end of each microcapillary”. In addition, the Howitz reference relies on diffusion and/or convection mechanisms to mix a second liquid passing into the microcapillary with a first liquid into the flow channel, which requires a sufficient amount of target fluid in the microcapillary. The Howitz reference therefore requires a substantial amount of dead volume in each microcapillary, precluding formation of a virtual wall with minimal dead volume.

Moreover, Applicants maintain one skilled in the art would not combine the references as suggested by the Examiner because the prior art teaches away from minimizing a virtual wall fluid interface port with minimal or zero dead volume to facilitate direct interfacing with a channel interior.

In addition, it is the Applicants position that the modifications proposed by the Examiner render the prior art invention being modified unsatisfactory for its intended purpose, change the principles of operation of the device and require a substantial reconstruction and redesign of the elements. (See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), and *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)). That is, the device of Singh requires the fluid to enter into the wells 606, 612, 702, 712 in order to operate. Further, if the device of Heller were modified as suggested by the Examiner, it would be inoperable for its intended purpose, because the efficiency of the sample loading could be compromised by the smaller fluid interface port. More simply, if the microcapillaries of Howitz were modified as suggested by the Examiner, diffusion of a dosed liquid in a target fluid within the microcapillary could not occur, as target fluid would not spread up to the ends of the microcapillary, as required by Howitz. Because the changes to the configuration of the capillaries of Howitz and application areas of Heller would require a substantial reconstruction and redesign of the elements, as well as a change in the basic principle under which the devices were designed to operate, the claimed invention is not obvious over the cited references.

The particular structure of the claimed fluid interface port allow the claimed device to perform in a particular manner not disclosed in the prior art. In fact, were the interfacing components in the cited references to have the claimed structure, the operation of the prior art devices would be significantly altered.

Furthermore, a reasonable expectation of success from the combination suggested by the Examiner is lacking. There is no indication that modifying the references to include a virtual wall fluid interface port of the claimed configuration and dimensions would be successful.

More simply, all the claim limitations are not taught or suggested by the prior art. As described above, even in combination, a virtual wall fluid interface port having zero dead volume and the claimed configuration and dimensions is not disclose or obvious from the prior art. In fact, the prior art teaches toward maximizing dead volume, while the claimed invention requires that no separation medium enters the fluid interface port. The Examiner has provided no support for the assertion that the references teach that it is desirable to minimize dead volume.

Therefore, the claims, which recite, directly or indirectly, that no separation medium is present within the fluid interface port, are patentable.

New claim 51:

Claim 51 depends from claim 1 and further recites a droplet generating system that includes a pin corresponding to each fluid interface port for forming and directing a droplet of a sample to the corresponding fluid interface port, a feature lacking in the cited prior art. The cited references do not use droplets to inject a sample into a channel. In addition, the cited references lack a disclosure of a droplet generating system that utilizes a dedicated pin for each fluid interface port.

As described above, all pending claims distinguish patentably over the cited references. For at least these reasons, Applicants request that the rejections under 35 U.S.C. §112 and 35 U.S.C. §103 be reconsidered and withdrawn.

**CONCLUSION**

For at least these reasons, Applicants respectfully submit that all pending examined claims are patentable, and request that the rejections be reconsidered and withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

If there are any remaining issues, we invite a call to Applicants' representative at the telephone number listed below.

Dated: September 20, 2007

Respectfully submitted,

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